

Designing and Building a 2 by 4 Display Box

By: Dale C. Maley
Fairbury, Illinois

Last Updated: November 7, 2023

I am the docent for the Strevell House, at 401 W. Livingston, in Pontiac, Illinois. In January of 2023, I cleaned out the upstairs storage closet. In this closet, I found a chunk of 2 by 4 wood left over from renovating the house.

The house was built in 1855. They used 2 by 4's that were 2.25 by 4.75 inches in cross-section.

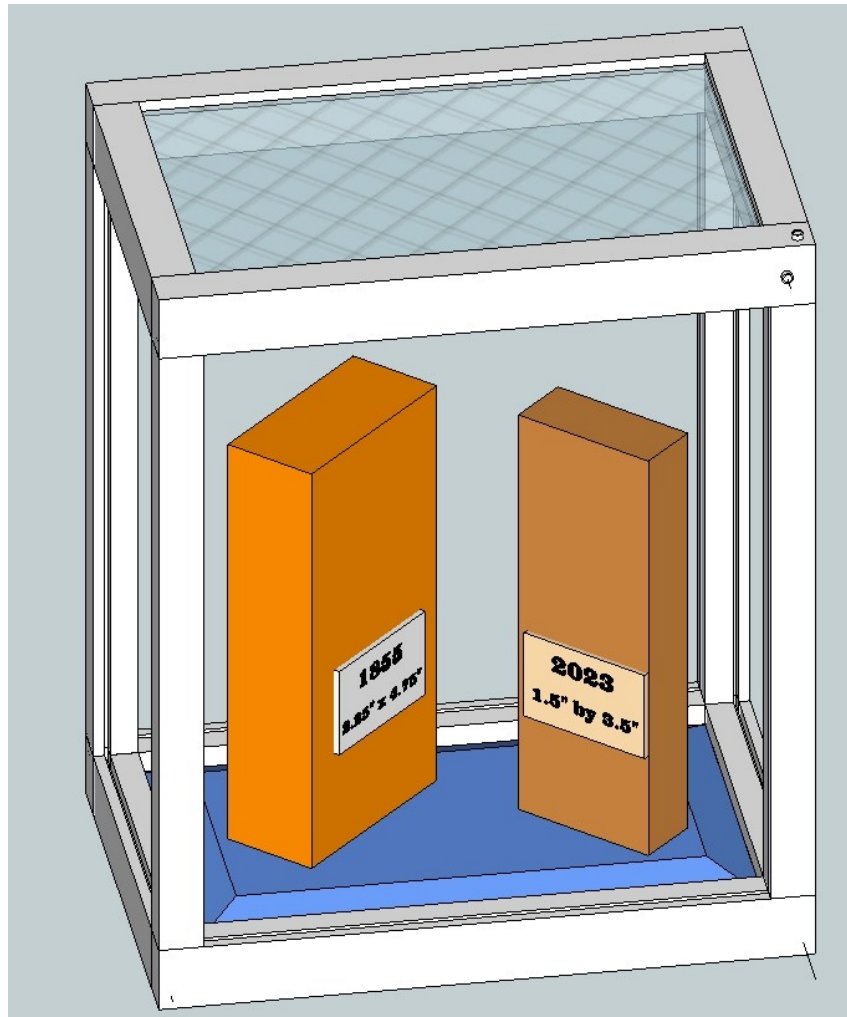
Modern 2 by 4's are 1.5 inches by 3.5 inches in cross-section,

I thought it would make a neat display, if I could show the massive stud from 1855 compared to the studs used to build houses today.

Photo of 1855 and 2023 Two by Four



Concept Design in Sketchup



I normally design stuff to be made from standard $\frac{3}{4}$ " stock, but on this project I planned on using some 2.5 by 2.5 inch white oak boards I already had in stock. So I went with 1" thick boards on this design.

One could probably make it work with standard $\frac{3}{4}$ " thick stock.

Panel Making Kit

I think I bought this kit in early 2023.



Could Not Find the Kit in my Basement !

I knew I put it into a tupperware storage box, to keep off the sawdust and not to lose the 3 white teflon set-up pieces. I just forgot I put them in a really big tupperware box !!



Router Table Set-up



Problem with Making Shaker Style Panel on the Router Table

I have to use a special fence, because my Shaker bit is a bigger diameter than the hole in the router table. I made this fence from scrap wood and it is not very wide.

Because it is not very wide, I have a hard time telling if I am holding the panel flat to the table, or not.

When I finished the Shaker panel and tried to insert it into my ¼" wide grooves, it did not fit on the long sides of the panel.....I think because I had tipped the panel a little bit when I routed it.

I could not see any easy way to sand down or reduce the thickness on both sides. I decided to re-route the ¼" wide grooves using a 5/16" wide bit I have. The panels fit loosely after I did this, which I think is ok.

On future projects, I should make a special wider fence when using the Shaker router bit.....and also consider making a 5/16" wide groove versus ¼".

Broke an 1/8" Router Bit

These bits are relatively fragile to start with. When I was about halfway done routing all the grooves, I broke a bit. Fortunately, I had another 1/8" bit to finish up with.

Keeping the Panel from Floating in the Rail and Stiles

I put a brad nail in the center of the top and center of the bottom panel (one the end that has the sawn cross-grain). This keeps the panel centered, yet the panel can still expand and contract in the direction across the grain. I used the air nailer to drive the brads into the hard white oak.

Figuring out how to attach the Components

To hold the 4 pieces around the bottom panel, I was ok with using glue and one ¼" dowel for each joint. There should be no need to ever take the base apart with the panel.

I need to stain and varnish, or stain and shellac the white oak components, and I do not want to get stain or poly/shellac on the clear acrylic panels.

I decided to use brass screws to the 4 vertical corner legs to the base, and use brass screws to attach the top frame to the 4 vertical legs. That way, I can stain and finish the items, then put the clear plastic in.

Process for Drilling Screw Holes in base to 4 vertical legs

1. Mark where I want the hole
2. Hammer in a short 1" long brad
3. Nip of brad with cutting plyers, leave about 1/8 to ¼" sticking up
4. Place mating piece in right position, over cut off brad
5. Smack mating piece down so cut off brad marks the hole location

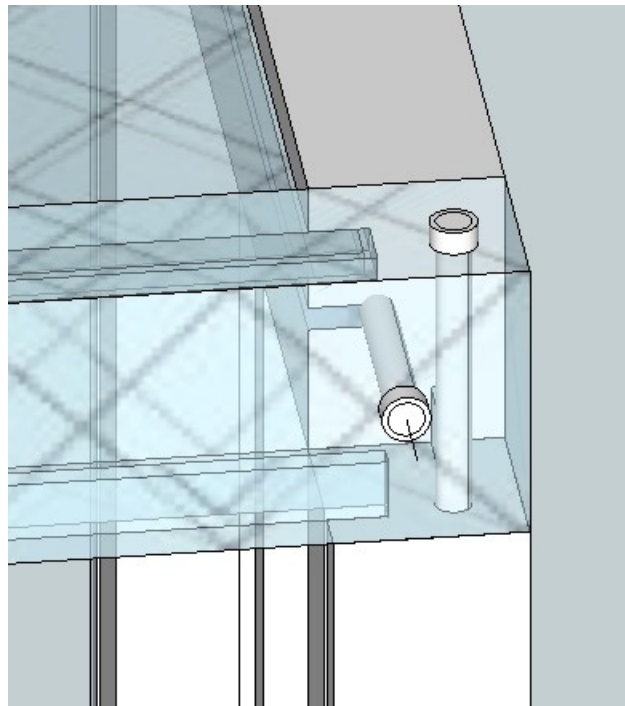
You now have both sides of the joint marked as well as I know how to. Drill a straight hole for the top of the screw, use a taper countersink bit to pre-drill where screw will bight into the wood.

Steel then Brass Screws

I learned the hard way, you should drive in a steel screw first, before you install the brass screw. If you use the brass screw first, you are likely to strip off the straight screwdriver slot. I use paraffin as a thread lubricant.

How to Attach Top Brass screws

I made the front top bar in a “transparent” color in Sketchup to make it easier to see where to put the 2 top screws so they don’t hit each other, or hit the acrylic panels.



Making the Screw Holes on the Top of the Display Box

I used the brad method, noted above to make the basic 4 sides of the frame, and screwed it together.

Then I marked the vertical brass screw hole using a paper print-out from Sketchup. I went to the drill press and drilled a straight hole in the top frame.

I then clamped the top frame to the 4 legs, then with the portable drill, ran down with the same pointed Brad bit through the existing hole to mark the hole in the vertical legs. I removed the top frame, took the 4 vertical legs to the drill press, and drill starter holes using the tapered countersink bit.

Basic Frame is Completed and ready for Acrylic



All the Acrylic Panels are in Place



Cutting the Acrylic

It has been a long time since I cut acrylic. I used to cut it on the scroll saw to prevent splintering from the table saw.

I tried the table saw on this project, and it worked fine.

What Stain to Use?

I like the color on the 2 Bodley stained glass lamps I made. I checked and I used teak stain.

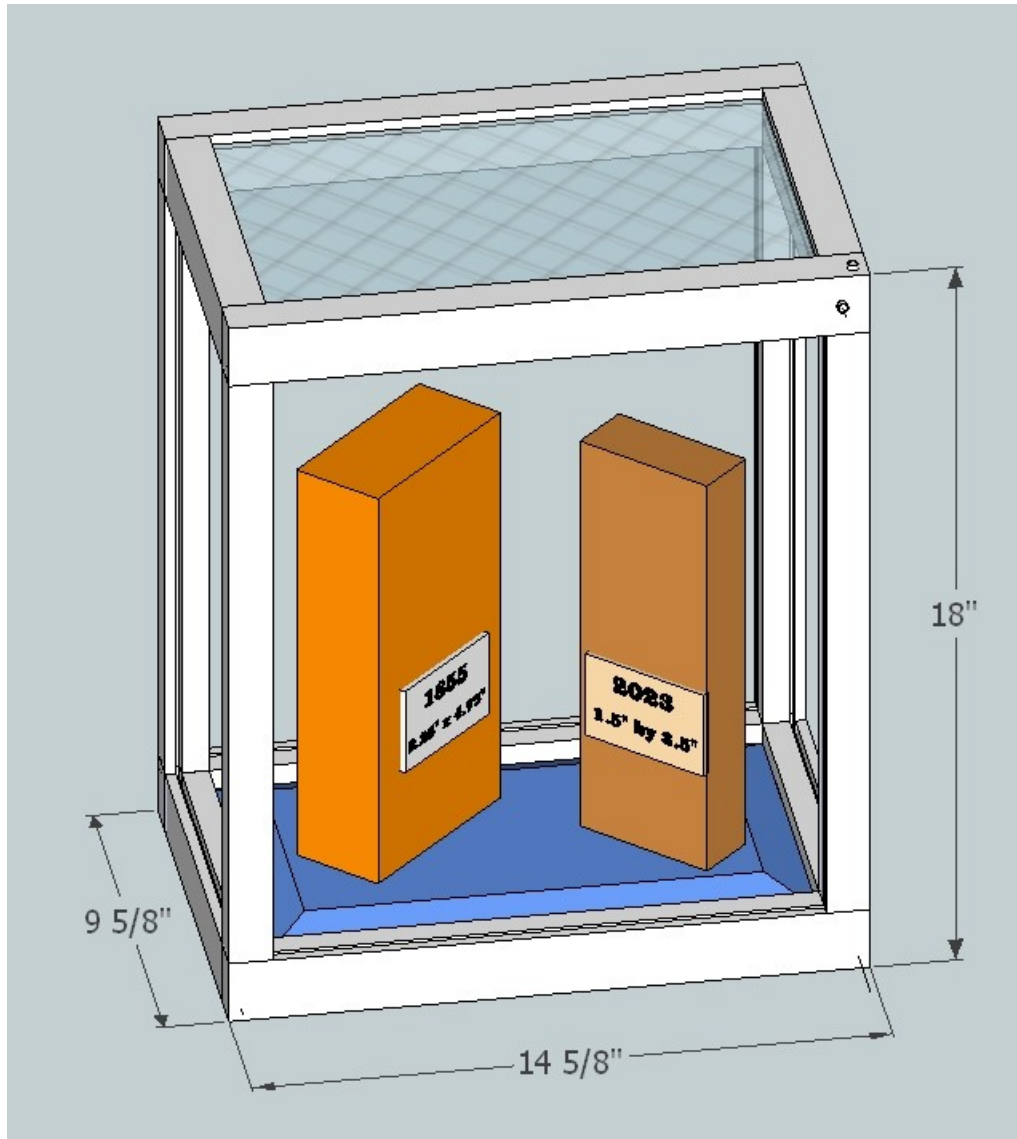


Ready to Sand and Stain

Since all the acrylic panels fit ok, it is time to sand and then stain.

I plan on using shellac on top of the oil based teak stain, since it dries quickly and looks good. Don't have to worry about water spots on this display case, which would prompt the use of polyurethane.

Packaging Drawing in Sketchup



Ran verticals and base back through router table

Although I got all the acrylic panels to fit in their grooves, it was a tight fit.

I moved the fence just a smidgeon on the router table and ran the 4 vertical posts and the base back through again, making the 1/8" grooves a hair wider. The front panel was the tightest, and it fit much better after I did this.

I already had the top dis-assembled, so I did not run those pieces back through again.

Marking all the Pieces

Since everything is basically a custom fit, I marked each mating joint using an awl to make dots.

Sanding

Sanding everything with 220 grit using a spindle sander attachment to my drill press at highest speed.

Teak Stain

I used a 1/2" wide brush to get the stain down into the 1/8" wide grooves, then wiped off the excess using a white shop rag.

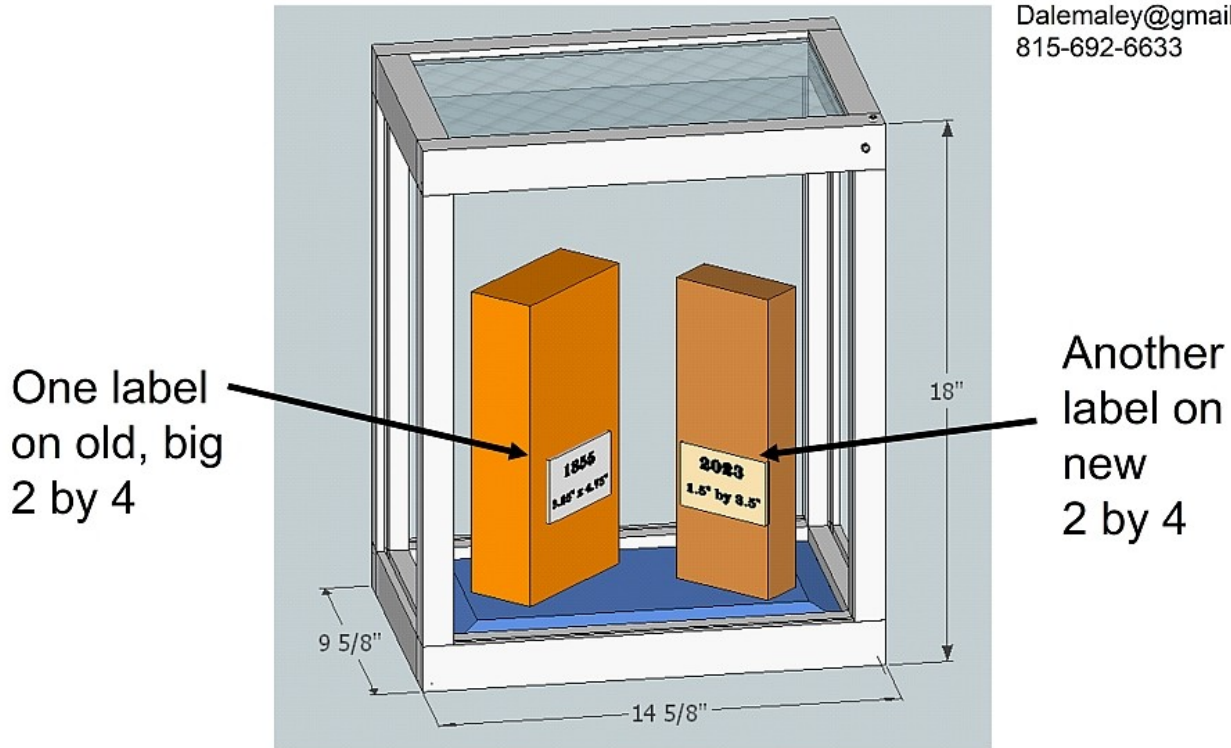
Getting 2 Labels Made

I dropped off the computer files for Aftershock Graphics in Fairbury to make my 2 labels.

I also make up an instruction package so they can see my application. Copies of the 3 pages are shown below.

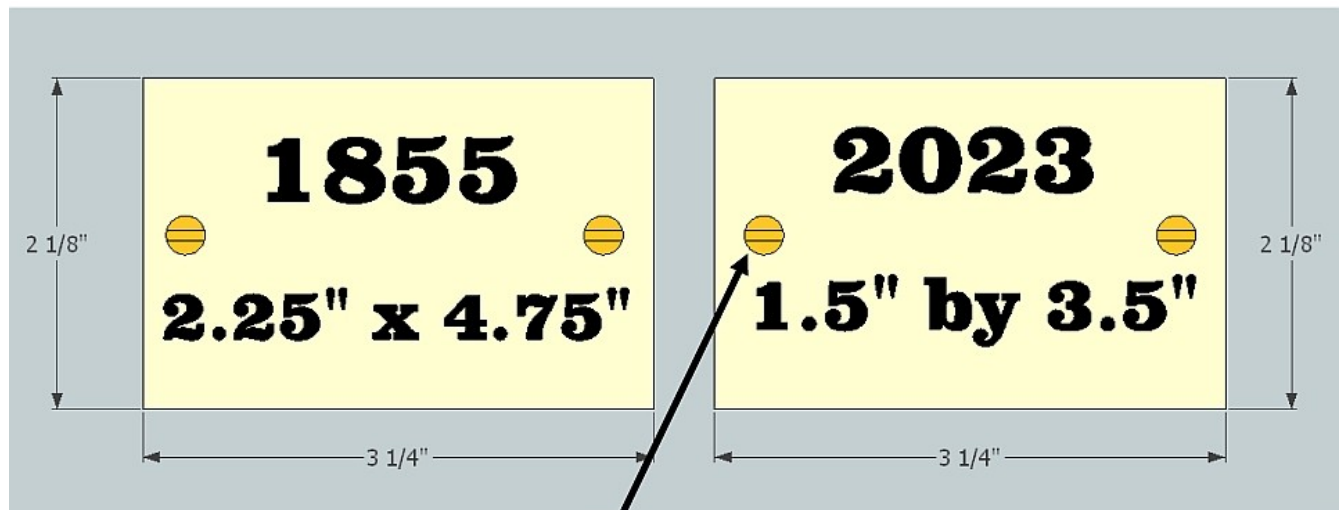
Two Little Labels for Old & New 2 by 4 Display

Dale C. Maley
Dalemaley@gmail.com
815-692-6633



Display cabinet to be permanent display at 1855 Strevell House in Pontiac

Two Little Labels for Old & New 2 by 4 Display



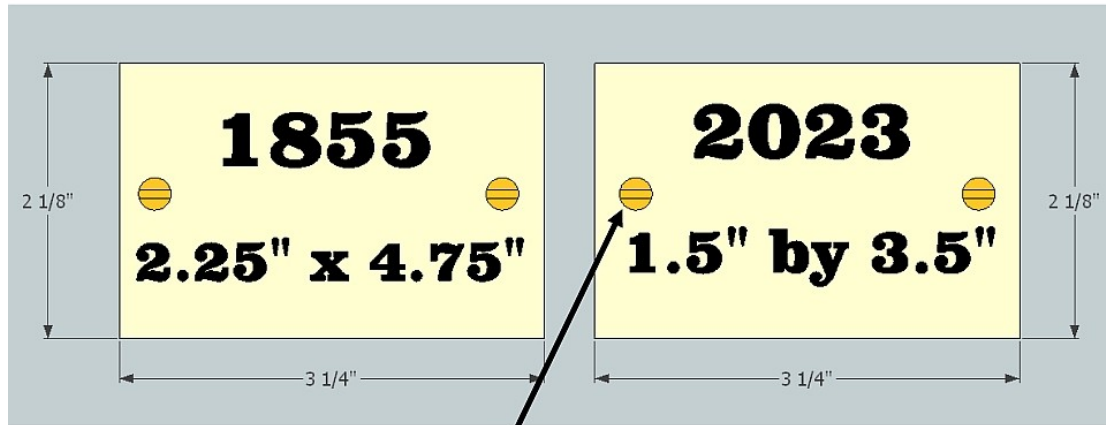
Dale to drill holes and
mount labels to each 2x4
with brass screws.

Two Little Labels for Old & New 2 by 4 Display

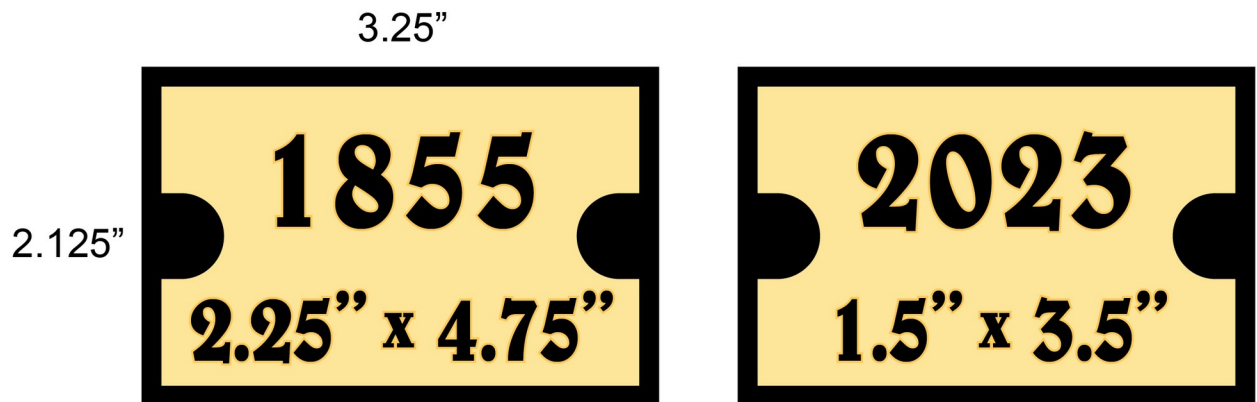


Approval Drawing for Labels from Aftershock Graphics

Two Little Labels for Old & New 2 by 4 Display



Dale to drill holes and
mount labels to each 2x4
with brass screws.



I approved the sample drawings 10/11/2023

Other Label Makers

There are lots of companies that will make these little labels.

Little Signs

I drilled them on the drill press for the brass screws. I have learned before when drilling plastic, keep holding down the sign hard after the drill bit breaks through and while you retract the bit. If you don't hold it tightly, the bit will pull off the plastic part and get stuck in the hole, or throw the piece.

Marking 2 screws per 2 by 4

I used Blue masking tape to mark where the 2 by 4's went, then drilled the holes in the base, then used countersink tapered bit to drill up and mark the 2 by 4s.



Finished Display Case on November 7, 2023



SketchUp Warehouse

I uploaded the model to Sketchup. You can [use this link to download it.](#)

Closing Thoughts on this Project

This is the 1st display case of this type that I have built.

I learned quite a bit.

I think I have another project coming up that needs a display case, so it should be easier to design and build that one !